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AMCPM-DR-T

MEMORANDUM FOR RECORD

23 December 1975

SUBJECT: Analysis of Exploratory Drilling Data, RMA

1. An exploratory drilling program was initiated at RMA to gather specific information on the subsurface system. Fifty-four bore holes were drilled along the sections shown on the attached map (Incl 1). The logs from these bore holes (Incl 2) show the nature of the sediment making up the ground water table aquifer, the depth to ground water, and the depth to bedrock. Subsurface cross-sections were constructed from these logs (Incl 3).

2. Bedrock Conditions

The drilling logs show that the bedrock is generally composed of clay/ claystone with some sand/sandstone. In bore holes 17, 18, 19, and 20 a notable quantity of sandstone was found in the bedrock. In bore holes 17, 18, and 19 the sandstone formed the top of the bedrock, in bore hole 20 the sandstone was covered by a weathered claystone. In all cases this bedrock sandstone did contain ground water. Sufficient drilling information is not available to determine the extent of this bedrock unit. These data do indicate that it is possible for a bedrock sand unit to be hydraulically linked to the water table aquifer. If such a bedrock sandstone were extensive enough it could act as a confined aquifer obtaining its recharge from the ground water table aquifer. When the comprehensive drilling program is undertaken, detailed logs should be kept on the bedrock to determine the presence and extent of permeable sandstone units.

Aquiter Sediment Conditions

a. The sediment above the bedrock was a clayey silty sand. At times some lenses of clean sand were encountered but these units were not extensive. Wells drilled into this type of sediment do not yeild sufficient quantities of water for pumping. Also, this type of sediment has a radius of pump well influence of only 5 to 10 meters (Jumikus, 1962). If conventional pump wells were installed the maximum spacing would be 5 to 10 meters unless specific aquifer test data indicated otherwise. Thus, with the data currently available, a conventional well system would not be considered adequate to control ground water flow.

b. A pumping trench will be required if ground water flow is to be controlled. This trench should be dug across the aquifer section. The trench would be backfilled with large gravel around perforated pipe. The perforated pipe would drain to a collection point or points where the water would be pumped for containment/treatment. The placement of such a pumping trench is dependent upon ground water movement and the concentration of suspected contaminants in the system. The depth of the trench is dependent upon the depth of contamination in the system.

4. Subsurface Cross Section Analysis

- a. An analysis of cross sections 0-0', P-P', and Q-Q' taken across the bedrock draw south of Basin C show that the bedrock channel narrows and becomes more "V" shaped to the south (X-Sec Q-Q'). The saturated portion of the sediment is more to the southwest (left side of X-Sections) than indicated by the USGS map data (Konikow, 1975). These data indicate that ground water flow coming from the Basin A area tends to flow more toward the west and northwest, even more so than indicated on the USGS ground water contour map. If such a volume of ground water is moving to the northwest, then the quantity of flow to the northeast from the Basin F area may be smaller than expected. If this flow is not small then some other flow conditions may be sustaining flow. Currently, not enough detail information is available to assess these flow conditions. These conditions should be noted and further evaluated as more data becomes available.
- b. Another notable feature is shown on X-Sections P-P' and Q-Q'. Bore holes 7 and 16 were drilled immediately northwest and southeast of Basin B. The ground water table in these holes shows the capillary rise associated with Basin B. Water stands in Basin B even after long dry periods. This is a surface expression of ground water. Basin B water is also augmented by surface run-off water principally from the Basin A area, along the ditching between these basins.
- c. Bore hole 12, X-Section Q-Q' shows a depressed ground water condition. This depression in the ground water table is probably due to increased permeability in this part of the aquifer. The drilling log for bore hole 12 also shows a higher sand content with less fines indicating a higher permeability. This again indicates more flow on the southwest side of the aquifer channel.
- d. X-Section R-R' was drilled southeast of Basin A. The complete section has been broken into sub-sections as marked on Inclosure 1. X-Section R-RT shows the ground water table to the southwest side of the section. This portion of the section is close to Upper Derby Lake and indicates that infiltration from the lake may be providing a good portion of the ground water

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recharge in this area. From USGS model work, Phase I, the recharge attributed to the lakes and industrial activities was determined to be 55 GPM. To further define this flow quantity, ground water level changes in this area should be compared to lake level changes. If Upper Derby Lake is the principal recharge source for ground water under Basin A, the level of this lake should be kept low to reduce the flow of ground water under Basin A.

- e. No water was noted in the remainder of X-Section R-RT₁, nor in X-Section RT₁-RT₂. X-Section RT₂-R' contained water in bore hole 39 with indications of some water in bore hole 40. These bore holes correspond to the lowest section of the bedrock high northeast of Basin A. Map data and Konikov's chloride model work (Incl 4) indicates that this part of the bedrock high could be flooded by ground water from under Basin A. The presence of water in these borings indicates that flooding has or is occurring. Verification of this overflow can be obtained by drilling a bore hole 500 feet northeast of bore hole #39 (Incl 4). If overflowing of this bedrock high is still occurring, a sample of ground water from the verification bore hole should be taken for analysis. This analysis will determine if any of the contaminants suspected in the Basin A area are moving into the First Creek drainage system at this point.
- f. Cross-Section S-S' was taken along the north boundary of the Arsenal. This section shows a depression in the bedrock surface under the bog, as well as under the existing First Creek channel. If contaminants are stratified in the ground water system, depressions such as these could provide undetected conduits for movement of contaminants. A lysimeter system should be placed near the location of bore hole 50, south of the bog. Lysimeters should be located at the bottom of the aquifer, the middle, and near the top. Analysis of these samples will show contaminant movement at all depths.
- g. West of the bog the bedrock surface forms a mound with bore hole #47 at the apex. Comparison of the water monitor plan DIMP map to this portion of the cross section shows that the highest concentration of DIMP coincides with the bedrock mound. This could be an indication of stratification. Also, the ground water contours (Konikow, 1975) are more closely spaced in this part of the section, indicating a higher velocity of flow (assuming constant transmissibility), than in the eastern part of the cross section. A lysimeter has been proposed for placement near bore hole 47. If this system was placed near the location of bore hole 45, the increased velocity effect as well as stratification could be evaluated.
- h. Besides the above data these cross sections show the bedrock configuration with sufficient accuracy to establish cost estimates for barriers placed

at these sections. These cross sections can also be used to compute section areas, ground water velocity, and ground water discharge rates.

5. Conclusions

- a. All drilling done at RMA should be accurately logged, especially the bedrock conditions. This logging is being done for the SGO drilling program and should be continued when the comprehensive drilling work is done.
- b. Data bearing on ground water flow conditions under Basins C, D, E, and F should be assembled and correlated to more accurately determine how the ground water flow from Basin A distributes to the north. These data include the depth to ground water each time a water sample is taken for analysis, the physical conditions of each monitor well (i.e., depth of well, casing depth, well screen length and depth, etc), and the water monitor plan results. These data are in the process of being gathered. Computer simulations of flow is being done by USGS and this data, intergated with the chemical data, will be useful. Also accurate logging for depth to water and depth to bedrock during the comprehensive drilling program should be done, especially in the Basins area.
- c. The monitoring of ground water levels from the sampling wells as well as other wells north of Upper Derby Lake should be done. At the same time the level of Upper Derby Lake should be monitored. Correlation of these data would indicate how much the ground water system under Basin A is being recharged by Upper Derby Lake.
- d. A verification hole should be drilled 500 feet northeast of bore hole 39 (Incl 1) to determine if ground water is breeching the bedrock high. This hole should be drilled during a period of high ground water. If water is found it should be analyzed under the existing water monitoring plan.
- e. Position two lysimeter sampling systems along the north boundary, one system near the location of bore hole 50 immediately south of the bog, and one near the location of bore hole 45 (Incl 1). Three lysimeters should be placed at each point, one near the bottom of the aquifer, one in the middle, and one at the top. Samples from these lysimeters should be analyzed under the existing water monitoring plan. These lysimeter sampling points are currently being considered in conjunction with other sampling points in the RMA cff post contamination plan revision.

4 Incl

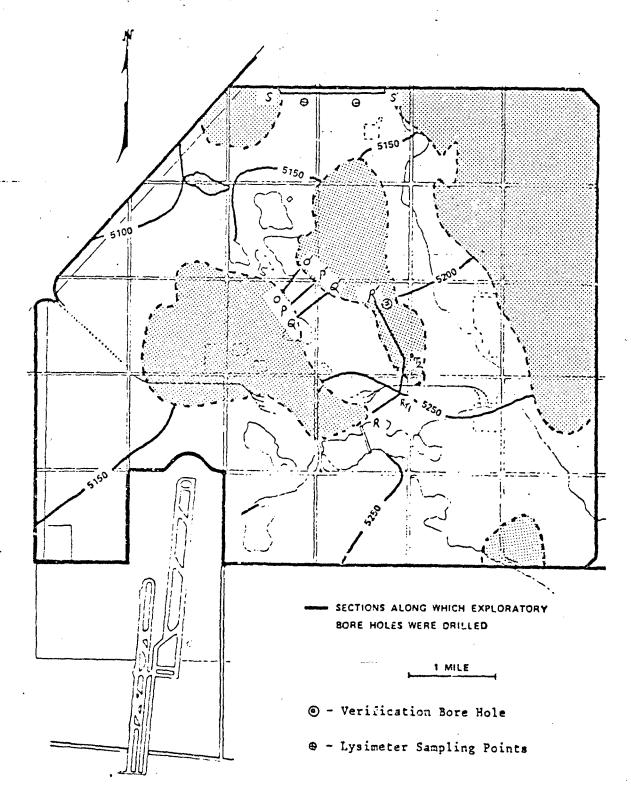
JOSEPH R. KOLMER

CPT, MSC

Technical Support Division

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EXPLORATORY BORE LOCATION PLAN

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Ground	Water	vrecco	ation	7		····		
					ATION OF	LAYERS		
Dep from	th	Soll Symbol			Soil	l Descript	ion	
9.0	C 7	:	0					
0,7	2.0	CL	B) 1775;	5T- V	1. 5AND	- 5117;		
2.0	7.0				51176			
7,0	12,6	CL	(F) U/2	T- U.	5 H ND-	<u>, -5;17</u>	3-	
12.6	26.0	Sc	7) 1,1,6	7-0	/A Oc -	<u>- 5:176</u>		
	<u> </u>		011	2000	<u> </u>	1001	@ 22	0 7 22 0
26.0	28.0	CH.	(10) 5	1170	0 /2/C570	r. p		
280	30.0	C '4	(11)					
r)		- 100			
					= WH			
						H G	260	
						<u> </u>		
				5 (2) 12			<u> </u>	
				F @ 2.				
			5					
	•			•	•			Ì
	ВІоп	Type	011)	PENETR		ot results	I Blow	10 eq 77
Dopth	Count					on i Dooth		Spoon
-							\(\frac{1}{2}\)	
			fi F					
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S.S. - 2"o.d.Split Spoon Sample. Cal. - California Spoon. S.T. - Shelby Tube

	1496	フ Prot・Ni	ame N195.720	E2.182	.965	D	ato 10-	30-75
roj.	. 11	Hole	Elov.	T2212	eat 1	Tole Dep	th 2	. <u>o</u>
.10 1	<u>ر ر</u>	/2		Samo	a Types	11/2-	100	1.5/0
nole T	700 P	<u>/ /</u>	5.6 Dopt		- //.4	P!.) d E	2.1
Dopth	to Bed	rock_/		in to no.	1110			· · /
Oround	Wator	vreedO	ation					
Dr. F	th I	Soil	CLASS	SIFICATI	ON OF TAY	ERS		
rom	40	Symbol			Soll Do:	criptio	n	
0.0	7.1.		<u>0</u>	<u> </u>				
0.6	T i	<u>c7</u>	(6) U. mci	57 /5	1007 -	<u> </u>	<u>ာ့ မ</u>	•
9.0	15,6	20	7) WET	- 5/ic	· 1. T/c	CI / FICA	6 (· / 7 · _
	15.0	CH			· ·		····	
17.n	20.0	~ H	(11)					<u> </u>
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			2015	9 F	WATER	- ,		•
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				<u> 17</u>	,0			
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		•	· P	ENETRÁT I	OY TEST R	ESULTS		•
Coptli	Blow Count		ora on a Dorth	Slon Count	l noog2		Blow Count	Type of Spoon
	1 3 3 3 11 4	1			ý,		. ,	2,50011
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S.S. - 2"o.d.Split Spoon Sample. Cal. - California Spoon. S.T. - Shelby Tube

Proje	No	Proj.N	ame_N/05860	E2	173,155		Dato 10	- ?) - ? -	
10	No. 11	Hole	Elev. 6	5231 <u>0</u>	est.	_Holo Do:	pth_/5	1	
Hole	Type	0/17		Samp	ole Types	H/5-	119	hile	
De p th	n to Bed	rock_	1,6. Dop	th to W.	T 1/2	P1	old Eng.	1.	
Groun	nd Water	vreedO·	ation	7	<u> </u>			• •	
					ON OF LAY	YERS			
Do Trom	pth to	Soil Symbol			Soil D	scripti	on		
0,0	136		0						
0.1.	1.6	sc	3) 11/2/	maist	- 511-	<u>, - c/.</u>	ما د. ه د.		
1,6	4.6	SM	(-) 1110-1	1/2015	~ /				
4.6	7,6	5C	D Indist	0/	11999 -	- Sil7	۳٤.,		
7.4	6 11,6	CZ	100157 (2) Villa	157 3	de dua.	r - '/	15 H 20	<u> </u>	ميخ
11,6	· ASS	CH						· · · · · · · · · · · · · · · · · · ·	
14,0	15.0	CH	<i>(7)</i>						
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 -			<i>}</i> —	D 141.0	3				
									
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		<u>!</u>							
			P		ON TEST				
Depti	Blow n Count	Typo Spo	of i Dopth	Blow Count	Spoon		Blow Count	lypo of Spoon	
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rei.	1494	Proj.N	amo_ <i>NI</i>	34.270	£ 2.7	52 020	I	Da to 10	-29-75
								oth 30	
icla ^m	v Deg . 12	1/0	•		Sampi	le Types	A/5	_ 209	hole
enth	to Bed	rock Z	28.0	Dopt	h to W.	r. 192	F Pie	ld Eng.	Rich
		053 01 v							
ounc	<i></i>	00001		•	TFICATIO	ON OF LAY	TERS T		
D≥ p Tom	th to	Soil Symbol				, Soil Da		ים.	
0.0			<u>(1)</u>			, 0011			
0.7	146			1100	11751				
14.6						5 21104			
	1	1	1			TG			
19.0	280	CL	(2) 11		· S	Mus.			
28.0		C H	١ _						
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			·	<u>, (3)</u>					
				: <i>(D</i> /	14.6				
			1.	10	19.0		·	····	
			1-	((3)	27.0				
					 	 			
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	<u> </u>								
				5 1	'እንዲጥ፡፡ <u>4</u> ጥ ተ	ON TEST	PESITE		
No n+h	Blow	Tyre		noth	blom Count	१५ छव ए।	i	Blow	17 po 01
Depth	Count	. 200	on H D	Spen	Count	Spoon	Dooth	Count .	Spoon
									
	<u> </u>		H H						
	1	0-3/5	Y	<u> </u>		- 6.316		202 S.T	- Shellov

roj.	11190	(7 [Proj.N	<u></u> emn	V 184,50	0	r 2 (1 + 2) (4)	10	_Dato_/2	-29-75	
in ti	0.13	Hole	Elev	•	1110	سلونده.	_Hole I	opth	0.0	
ole T	ypo F	1/11			Samp	le Type:	17/5	- 200	hole	_
opth	to Bod	rock 3	7,0	Dop!	th to W.	T. 22	2.0	Piold Eng.	His/	
		Observ								 •
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De p rom	th to	Soll Symbol				Soil	Doscript	tion		
	2.7		(
0,7	16,0	SM	(D)/	1100	1115:5					
•	,		1	1119:5	7 6	12.0				
160	29.0	5 C	7):	1107	- Sil	75 -	Clare	PC		
29.0	37.0	04	(B) (ルタフ	- V. 5	11.007 -	· 5:/7	oes L		1
	40.0									
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			1		<u>7.0</u>	•				┦`
					16.0					-
					26.0					┥•
					29,0					-
				4 3	370					-
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			•	P	EKETRAT I	ON TEST	RESULTS	5		
Dopth	Blow Count	17 P3 00 S		Cooth	blow Count	0 6651		Blox	Typo of	7
20 Dell	Count	300	<u> </u>			0,000		·	3,500.1	1
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	1	_ 1			<u> </u>				L	-

Consul	ting	Soll	Eng	inoc	re

					32, 100 Hole Da		
) TO W	<u>ب</u> تر	7/0		Somo	10 Tone H/5	- / 20	1.10
)10 T	y pe_/	<i></i>	100	Samp.	10 Typos <u>H/5</u>	6	0/
pth	to Bod	<u> </u>	Fig. O Dog	oth to W.	r. 1/16 Pi	.old Eng	,
round	Water	055014	ation				
D		Soil	CLAS	SIFICATIO	ON OF LAYERS		
Dep rom	to	Symbol			Soil Doscripti	on	
0,0			(7)				
2,6	2.0	<u>5 C</u>	7: 11120	maist	-51175.		
	26.0						
					12.0		
260	420	sc	カンシュナー	- claus	oc -51/-y		
12.0	50,0	CH					
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			MOT	フュ	munt war	707	
			5 6	0 7.6			
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			4 (420			
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	Blow	Typs	017	Plou	TABA OTH	mlom	1750 01
epth	Count	Spc	on i Depth	Count	Scoon Dopth	Count	Spoon
		•		 			
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oj. No. Proj. Namo 11 - 760 F2,182,690 Date 11-29-7	<u>-</u>
ole No. 15 Hole Elev. 52362 est Hole Depth 65.0	
ule Type 2/11 Sample Types #/5 - 120 /1/0	
opth to Bedrock 56.0 Dopth to W.T. 18.6 Pield Eng. 12	<u>/,</u>
round Water Observation	
CLASSIFICATION OF LAYERS	
Depth Soil Symbol Soil Description	
0.0 2.4 (1)	
o. 6 2,6 SC (7) mod mist - Silty - Clause	
2.6 17.0 5M Fried mist	
Mist @ 8.0	
1127 (213.6	
17.0 30.0 SC FILVET - 5/10/27/4 Clause - 51/1-	_
30,0 42,6 SM(7) 2005	
12,6 560 SC 7/10t-5/15/17/4 C/49ec-511T4	
5,060,0 CH(I)	
NOT TO MUCH LUATOR	_
5 (3,6	
H @. 17.0	
H @ 112.6.	
H (3 560.	-
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PENETRATION TEST RESULTS	
Blon Libs oil Blon Libs oil Blon Libs	
Apth Count Spoon Depth Count Spoon Depth Count Spoo	
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S 2"o.d.Split Spoon Sample. Cal California Spoon. S.T She	

roje	1.796	Proj.11	Inmo 11/84,560 12,192,276 Dato 15-27-5	
-10 N	0.16	Holo	Elov. 7233 2 sat Holo Depth 50,0	
ole T	y po	1/1	Sample Types 11/5 - 209 /19/8	_
booth	to Bod	rock 5	Sample Types 11/5 - 200 /19/8 6.0' Depth to 7.T. 12,6' Field Eng. 1992	_
			vation	
			CLASSIFICATION OF LAYERS	_
in p	٠ ٢ ٢	Soll Symbol	Soil Description	
0.0	. , , ,	;	· U	
ر ا	12,6	SC	5. mod posier - sitta - clasies	
			MET + Slightle Olaces C. 5.6	
12,6	21,0		(2) 1/2 T	
	39.6	50	(3) Unst - 1 /11 50 511Ty	
346	56,0	SM	2005	4
~~	10.0	0.44	w/oc. 12 50.1, 7, 51.5	4
260	60,0	CH		-
			MAT TO MUCH WATOR	-
				\dashv
			-0-56 H 0 50 4	+
			T @ 5,6 H @ 50,4 H @ 21.0 S @ 56.0	1
			H @ 26.0 H @ 57.6	1
			c (3 34/2	-
			H @ 40.6	7
			·	
				1
	Blow	Туре	PENETRATION TEST RESULTS OF Slow Typo of Slow Typo of	_
epth	Count	Spo	on & Dorth Count Spoon Dorth Count Spoon	
		 		4
		.'		4
				-
			Spoon Sample. Cal California Spoon. S.T Shelb	4

Proj.	116.76	7 Projek	ams <u>N/34</u>	170	E2.133,000		Date 10	-30-75	
lo N	0. 17	Hole	Elev	52360	sut.	Hole Do	pth 5	0,0	_
	7 po_/			Sam	olo Typos	H/s-	200	Lile	_
nozo -	to Bed	rock 4	16.0 D	opth to W.	T. 21	O Pi	old Eng.	Wich.	_
		0530TV		_			•		•
Promio	110001			ASSIFICAT	ION OF IAN	CERS			-
120		Soil Symbol				scripti	0.0		
0.0	2.7	13 7 1110 2	(1)	····					1.
~,7	1.6	SCI	7) 1/12.d	MAST	5/19/	-/c. C.	10000 -	-5117	
1.6	11.0		(2) Med			/		,	1
	14.0		Dilpool			7/1. 0	114 04	- 51174	
	37.0	SM	(P) (1)~5	<i>-</i>	Ø.		· · · · · · · · · · · · · · · · · · ·]
	46.0				ANDG -	-5:17			
	49.0	SMI	Dujet Buj	small p	00,6275	07	clac	アフリヒ	
99.0	50.0				-	-	•	The second secon	
			L075	<u>5</u>	COATO	<u> </u>			
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				<u> </u>	HO	46.	0		-
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				<u> 3 27.0</u>		· · · · · · · · · · · · · · · · · · ·	<u></u>	•	-
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	_	•		PENETRATI	ON TEST F	RESULTS			
epth	Blow Count	Typo	of # Denth	B J O H	1;0 ed £1		Blow Count	lo edfl roodS	
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		."	g!					• .	27
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.s	2"0.1.	Split S	Spoon Sama	la. Cal.	- Califo	rnia Sp	oon. S.T.	- Shalbv	בות ד

roj.	1.776 No	Proj.N.	ms <u>N/3</u>	5.085	Ę	2.183,150	·	Da to 10-	29-75
1 A N	0.18	Hole	Elov.	يرسون	360	est	Hole De	pth 3	5,0
r efoi	رز زر 80 م	نىز/			Samp	le Types	4/5-	100 /	1. le
opth	to Bed	rock_2	9.6	_Do pth	to W.	T. 17.	O Pi	Zoa /	11/2 /
round	Water	Obsorv	ation_						
				CIASSI	FICATI	ON OF LAY	(ERS		
lal mon	th	Soil Symbol				Soil Da	scripti	on	1
	0,6		(1)						
1/2	14,0	500	7///	-d 11	10157	c/~	1500-	Silte	
			111	11:57	@ b.	0			
14.0	18.6	SM							
	2/.0				list.	T/2 01	n n=2:, -	- 5117	Ç
	260	cL	(E) (d)	· 7 - U	1500	154	• /	- 5117	
	29,6		\bigcirc	: ,+-		<u> </u>			
29.6	32.6	SM	(13)	يتواند سيوان شيريني					
33.2	32,6 35.0	C #	(11)	9					
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			11/3T	75	ع ۱۵۲۲	ch cu.	272 r		
			/	40,	2.0				
			μ.	1 0 1	15.6				
			1	/ (D a	9,6				
			/-	্ <u>তি</u> ভ	126				
				·					
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	Blow	1,4 bo	0111	PEN	ETRATI Blow	ON TEST		Blok	'iype oi'
asth	Count	Spc		oth	Count	Spoon		Count	Spoon

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			ā.) 			

									-29-75
vle N	10. <u>17</u>	Hole	Elov		52350	est	Hole Do	pth_S4), Ü
Hole T	y po	1/1	-		Samp	oeqyT elc	14/5	Loca to	10
Dopth	to Bad	rock_2	0.6	Do p	th to W.	.T. 16.	6 P1	.old Eng.	10 12-/
		05serv							
			-	CIAS	SIFICATI	ION OF LA	YERS		
De p	th	Soll Symbol		ساده د ما کنونالونان ورد و د		Soil I	<u> </u>	on	
0.0	- /-		17	, P - 40					
0,6	2,6	SC	7.12	od 10	11:57 .	- 51176			
2.6	6.0	SM.	2/11	70 d	moist	,			
6.0	15.0	5C 1	200	70.5 -	5/12	1.7/4 G 10	C/4c.	2.4	
				7-66	a /Men	G 10	7,0		
		CL	16/C	· · · · ·	5 H1100	· · · · · ·			
		SM		ستمسئده مارد					
36,0	30,0	CH	(11)						
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	·	أسسيت يستسيب							
	<u> </u>			P		ON TEST			
Dopth	Blow Count	00S		Dapth	Blow Count	iypa oi Spoon	i = Dopth	Blow Count	Typs of
		·	į				Ā		
		·	7.300						
			, g						
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8 6	27 4	9071+	SHOWN	Samala	1. Cal.	- Calic	annia Ca	~~~ C T	. Ch - 7 h - 1

oj.	14/70 No•	_Proj.N	ame N185 1170 F2,173, 675 Do to 10-27-75
		Hole	Elev2050 cot Hole Dopth -/0.0
	ypo /	1/:4	Sample Types H/s- Log hole
opth	to Bed	rock_5	6 Depth to 7.T. 15,6 Field Eng. Kirl
round	Water	ν π οεζ0	ation
			CLASSIFICATION OF LAYERS .
De p Tom	to	Soil Symbol	Soil Description
0.0	0,6		
06	40	SC	Of 19 d mist to mist
			LAYELT of Clay + SAND
4,0	5.6	CL	(6) misser to U. misst
	9.6		To med wist to mist
9,6	36.0	SM	(13) UST @ 14.0
36.0	38.0	CH	(1)
3 4.0	40.0	C 41	(15) Klee shale
			LOTS OF WATER
			Small odse in hile
			S & 4.0 H @ 350
			5 Ci 5 Ci H Q 38.0
			4096
			V, H @ 25,6
			5 @ 27.6
	·		
	Blow	Type	PENETRATION TEST RESULTS org Slow Type or Slow Type or
Depth	Count		on Depth Count Spoon Depth Count Spoon
-			<u> </u>
-			

KAL ZEFF AND ASSOCIATES

	1.19	17 SP	<u> </u>	Con: 2/ <i>1798</i>	sulting 00 Ed. N179.5	Soil Eng	inoors	در در ۱۰۰۰ دم گ	
roj.	N6	Proj.N	amo 🌆	1-5-5	Ed. N 179,5				1-29-75
		Hole	Elov.	·	216 2 20	<i>-</i> ,	Hole Do	pth 25	, 0
iole 1	ry po //)/:-)			Samp	le Types	H/5-	209	hole
mpth	to Bed	rock /8	.0	Do p	th to W.	T. //.	6F1	ald Eng.	Bic/
round	y Water	05serv	ation						
				CTAS	SIFICATI	ON OF LA	YERS		
rom	pth to	Soll Symbol				Soil D	oscripti	on	
0,0	0,6		7)	·					
3.6	2,6	SC	(7) 1.	1130 1	nnist-	- 5/172			
			ی	linh	7/4 01	Nuce	6 1.	6 To	2.6
2,6	5.0	5AV	13) 4.	اء درور	11.1157	-			
5.0	5.0	SC	3) 41	1015	$T - C_{\lambda}$	111000	:	119/17/4	. Ofm.
	·		۷		O 7.0				
18.0	25.0	CH	(1)						
			457	<u></u>	0 t	W 47	PP	<u> </u>	
								*	
······································					1.6		<u> </u>). 6	
					2.6		·		•
	·				7.0			_	
			/	40	18.0				-
							· · · · · · · · · · · · · · · · · · ·		•
	.1								
				P	ENETRATI	ON_TEST	RESULTS		
Dopth	Blow	Type		noth	Blow Count	1,250 01		blow Count	Type of Spoon
									Spoon
		.4							• ,
-	1	1	i i						

S.S. - 2 o.d. Split Spoon Sample. Cal. - California Spoon. S.T. - Shelby Tub

Proj	36.490	Proj. Ne	mo <u>N /83, 2322</u>	·	E2.186,400	,	ato 10	- 29-75
110	No. 22	Hole	Elov5	2640 4	<u>+ H</u>	ole Dop	th 20	, 0
Hole	Type P	/A		Samp	le Types /	1/5 -	Lon 1	lole
De p th	to Bed	rock_/	4.0 Dopt	th to W.	T. 17,0	Pio	ld Eng.	"tich
Groui	nd Water	Орзети	stion					
		6-15	CLASS	SIFICATI	ON OF LAYE	RS		· · · · · · · · · · · · · · · · · · ·
from	to	Soil Symbol			Soil Dos			
0	5.6		3) 17. 115-	T - C	/A 5- 5	11204		
5.6	14.0	CL	6) we T	T- V.	54204	7		
14.	16.6	CH						
16,	20.0	CH	<u> </u>					
1								
 			•		 /			
			NOT	7) /	m40-h	レノドブ	<u>e </u>	
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### KAL ZEFF AND ASSOCIATES Consulting Soil Engineers

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#### KAL ZEFF AND ASSOCIATES Consulting Soil Engineers

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## KAL ZEFF AND ASSOCIATES Consulting Soil Engineers

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#### KAL ZEFF AND ASSOCIATES Consulting Soil Engineers

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.S. - 2"o.d.Split Spoon Sample. Cal. - California Spoon. S.T. - Sholby Tube

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cle T	ype C	/A	Sample Types H/5- Log 1,0	10
opth	to Bod	rock_/	8.0 Depth to W.T. 11.0 Pield Eng. R	Pic/
-		Obsorv		
			CLASSIFICATION OF LAYERS	
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	4,0	040	6) moist-U.SANDY	
4.0	6.5		7) msist	
6.0	9.0		(B) U. Moist - U. SANDY	
<u>0,0</u>	1		v. cel. @ 7.6 - 9.0	
9.0	11:0	50	DU moist	
11.0			(2) Misist	
<u> </u>			WCT @ 12,6	
16.0	18.0	5 6	Quet-w/ac there	
18.0	20.0	СH	<u> </u>	·
			LOTS OF WATER	
			smell oDOR IN HOLE	
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			H @ 9.0	
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		1	Spoon Sample. Cal California Spoon. S.T	

#### KAL ZEFF AND ASSOCIATES Consulting Soil Engineers

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lo N	0. 47	Hole	Elev. Holo Depth 20.0					
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			. <u>5 @ 7, 6</u>					
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			H @ 17.0					
			77 @ 77.0					
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S.S. - 2"n.d.Snlit Spoon Sample. Cal. - California Spoon. S.T. - Shelby Tul

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S.S. - 2"o.d.Split Spoon Sample. Cal. - California Spoon. S.T. - Sholby Tut

#### KAL ZEFF AND ASSOCIATES Consulting Soil Engineers

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S.S. - 2"o.d.Split Spoon Sample. Cal. - California Spoon. S.T. - Shelby Tube

olo	147.	67 Proj.11	g ms				ato /3-	30-75-
			Elov.			Hole Dep	oth 27	0.0
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			Spoon Sample					

### - KAL ZEFF AND ASSOCIATES Consulting Soil Engineers

Proj. NoProj.	łame		De to	30-75				
	Elev	Hole Dipth 33.0						
Hole Type P/A	Samp	ole Types H/s -	200 /11/	2				
Depth to Bedrock	30,0 Depth to W.	T. 16.6 Pi	old Eng.	Pich				
Ground Water Obser								
	CLASSIFICATI	ON OF LAYERS						
Tepth Soil from to Symbo		Soil Doscripti	on					
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	U) GC. M.	. <u>(0</u> 27.	6 Xs	23.0				
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				<u></u>				
	2075	OF WATER						
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	5 @ 18.0	,						
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	5 @ 23,0							
	H.@ 27.6	,						
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	off Dapth Count	iypa oti Spean Dopth	blow Count	'ly pa ol' Spoon				
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	<b>§</b>	73.3		1				

S.S. - 2" A Solit Spoon Sample. Cal. - California Spoon. S.T. - Shalby Tubo

/4967 roj. NoProj.N	mo
No. 54 Hole	· · · · · · · · · · · · · · · · · · ·
010 Type <u>P//</u>	Sample Types A/5- 200 1.5/e
epth to Bedrock_4	15,0 Depth to W.T. 45,0 Pield Eng. Rick
round Water Observ	
- Cana	CLASSIFICATION OF LAYERS
Depth Soil	
rom to Symbol	7
	(8) mod moist
13.6 13.0 SC	Dined moist- Slightly Clausey - 4. in
	(B) MOIST - U. SANDY - SITE
21.6266 50	(3) insist—5:176
	(9) moist - ul acc. Munul
	(8) mod mist
	17) mist - w/ oc line Hund-c/Ayor
	B) moist-sandy to 11. sanon
i i	m - Wet '0 42.6
	HO 13.6 HO 45.0
	H @ 18.0 5 @ 47.6
·	H @ 21.6
	H@26.6 LOTS OF WATER
	5 @ 28,6 AtTer 42,6
<u> </u>	H @ 31,0
	5 @ 42.6
Blon Type	PENETRATION TEST RESULTS  O OI, USON   Typo OI   Blow   Typo OI
	oon Dooth Count Spoon Dooth Count Spoon
	Space Survive Call Carrie Space S. T. Shalby To

迚	$\approx$	TOPSOIL C/45- 5HNDY - 51,74
		ASPHALT, CONCRETE
3-)	1655 TITI	FILL-clay, sandy cinders (*), rubble (*), trash (*)
	صمم	CLAY, sandy, silty, very soft, very moist, wet, brown
	ست	CLAY, sandy, silty, medium stiff, lt., ned., very moist, wet,
	<u> </u>	brown
G)	[]]	CLAY, sandy to very sandy, silty, very extremely stiff, lt sined.
	To To	very moist, swet, brown - w/ occ. Mindel
		CLAY, very sandy to SAND, clayey, soft to stiff, moist, brown,
		occasionally gravelly
<b>8</b> 7	<b>1933</b>	SAND, slightly silty to silty, poorly graded, firm, dense,
	مبد	dry, It is medit very moist wet, some gravel, cobbles & boulders
27	<b>P</b> 3	SANDS \( \square\) GRAVEL, well graded, toose, medium dense, dense,
		1t to med to very moist towet, some cobbles & boulders
0)	ग्र	CLAY (severely weathered claystone) very stiff, moist
- <del>1</del> )	1223 1777	CLAYSTONE BEDROCK (Shale), weathered, firm medium hard, 15
	$\alpha m$	hard, moist, yellow, brown, gray-GReew
.2)		CLAYSTONE REDROCK (Shale), weathered, firm, medium hard,
	تنننا	hard, meist, yellow, brown, gray
.3)		SANDSTONE BEDROCK, weathered, medium hard, hard,
	क्रिक्स	some pockets of claystone, yellow-brown
.4)		SILTSTONE BEDROCK (Shale), weathered, firm to hard,
	emn)	Þ
.5)	F 7	Plue shale BIIDROCK (Shale), very hard - claystone
(6)		SAMUSTONE-CLAYSTONE BEDROCK (Shale), weathered, firm, hard,
	tenind ,	vellew-brown
,,		SAMBSTONE (conglomorate BEDROCK hard
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•	WHAT IS PRESENT USE OF SITE: RD1 A
1	TYPE OF VEGETATION ON SURFACE CRASS- weeds
•	ARE THERE SHRINKAGE CRACKS IN SURFACE? NO WIDTH DEPTH
1	IS THERE EVIDENCE OR HISTORY OF CUT AND/OR FILL ON THE SITE (DESIGNATE PLAN)? VCS - FILL + CYT
ţ	DEPTH OF TOPSOIL (USE SHOVEL TO DETERMINE) 0.3 70 0.7
	ARE THERE ANY PONDS, CREEKS, SEEPS, IRRIGATION DITCHES, OR OTHER EVIDEN OF WATER (DESIGNATE ON PLAN, GET ELEVATIONS)? <u>Jes-0 recks + Powps</u>
	ARE THERE ANY ROCK OUTCROPS? NEDESIGNATE ON SITE PLAN, BRING SAMPLE TO
	ARE THERE COBBLES AND/OR BOULDERS AT SURFACE (DESIGNATE AREAS ON SITE PLAN)?
•	DESCRIBE ANY EXISTING BUILDINGS, BASEMENTS OR EXCAVATIONS ON SITE OR AD JACENT TO IT, EXCLUDING TYPE OF FOUNDATION AND LOADING, IF AVAILABLE
	ARE EXISTING BUILDINGS IN NEIGHBORHOOD DAMAGES FROM FOUNDATION MOVEMENT
•	WOULD HOLES STAND OPEN FOR DRILLED PIERS? NO APPROXIMATELY HOW DEEP?  FOR BELLED PIERS? NES AT WHAT CEPTH IN BOURSCH
1	WERE HOLES LEFT OPEN? WHY? W/T
١	WOULD YOU RECOMMEND TAKING ADDITIONAL WATER-TABLE MEASUREMENTS? Les
į	DATE DRILLING WAS COMPLÉTED 10-30-75
١	WERE LOCAL ENGINEER AND ARCHITECTS CONTACTED? (IF OUT OF TOWN)
•	ANY OTHER COMMENTS, SUGGESTIONS OR CAUTIONS

R: 1

### WATER TABLE

DATE: 10-31-75

DLE	HOLE	DEPTH TO	DEPTH TO MUDXX.	DEPTH TOXX	1
7	45.0	6.6	•		
8	45,0	12.6			
9	30,0	6.6			
10	20,0	6,0			
1/	15.0			14.0	
17	50,0	17.0			
34	20.0			17,0	CAVED .
35	20.0			18.6	CAUED
36	20,0			15.6	CAUED
37	200			16.6	CAUED
38	25.0			18.6	CHUED
39	30,0	21.6			
40	25.0		24.6		
41	25.0		24.6		
42	20.0	7.0			
43	20.0	6.6			• •
44	30,0_	7.0			
45	25.0	10.0			
46	25,0	12.6			
47	20,0	13.0			
48	20,0	8.0			
49	20,0	5,0	!		
50	35.0	5.6			
5-/	20.0	7.6			eriproportional extension to a total control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the
52	27.0	4.6			
5-3	33.0.	11.6			
54	50,0	320			
B NO/				ED BY: RIC	• •

JOB NO. 14967 * FROM FIELD ENGINEER'S DRILL LOGS

ST GROUND SURFACE TO WATER/MUD/DRY BOTTOM

HOLE	HOLE	DEPTH TO	DEPTH TO	DEPTH TOXX	DEHARVE
Y.BER	DEPTHX	WATERXX	××CUM .	DRY BOTTOM	REMARKS
	35,0	10.0			
6	50,0	121.0			
12	30,0	25.6			
/3	40,0		11,0		CAVED
141	50,0	14.0			
				·	
15	60,0	16.0			
16	60,0	8.0			
18	35,0	14.0			
19	30,0	12.0			
20	210,0	18.0			
		·			
2/	25.0	9.0			
2	20.0	10,0			
23	15,0	13,6			
24/	10,0			9.0	
25	10,0			9.0	
					•
26	10.0			9.6	·
27	15.0	11,0		-	·
28	15.0			12.6	CAUED
29	10,0			8,0	CAUED
<u>29</u> 30	10.0			8,0	CAUED
3/	10.0			8.0	CAUED
32	15,0			14.0	
3 3	15.0			10,0	CAUED
offer the distribution of the party of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the					
100 410	111515	<u></u>	<u> </u>	ا <u>ا</u>	<u> </u>

108 NO. 14947 CHECKED BY: PICH + TOE

DTE : IF HOLE IS CAVED, INDICATE IN REMARKS

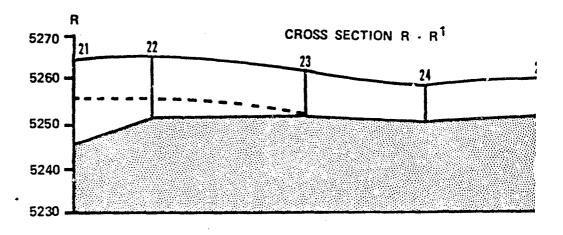
^{*} GROUND SURFACE TO WATER/MUD/DRY BOTTOM

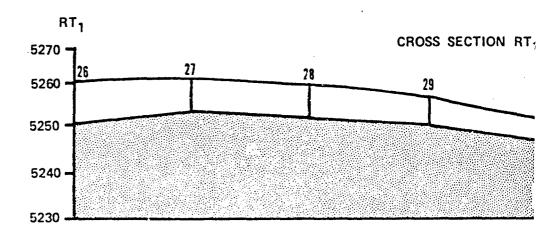
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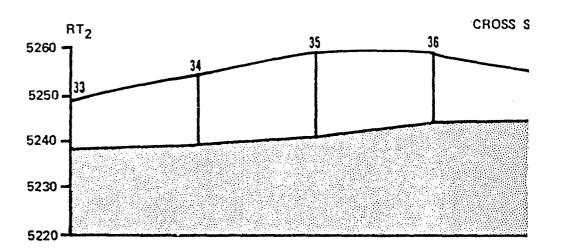
DATE: 12-29-75

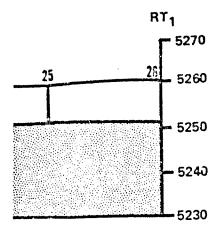
HOLE MBER	HOLE DEPTH×	DEPTH TO	DEPTH TO MUDXX	DEPTH TOXX DRY BOTTOM	
	270	15.1			
2	20.0	16.9			
0)	23.5			22.0	
4	15.0			14,2	
	·				
					•
			·		
	entre de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la constitución de la c				
		•			

OB NO. 14747 CHECKED BY: 17104 L JOB
FROM FIELD ENGINEER'S DRILL LOGS
GROUND SURFACE TO WATER/MUD/DRY BOTTOM
TE: IF HOLE IS CAVED, INDICATE IN REMARKS



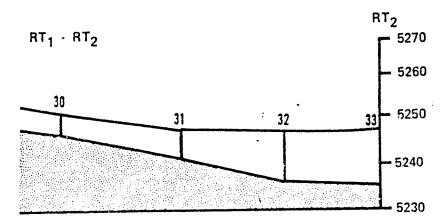


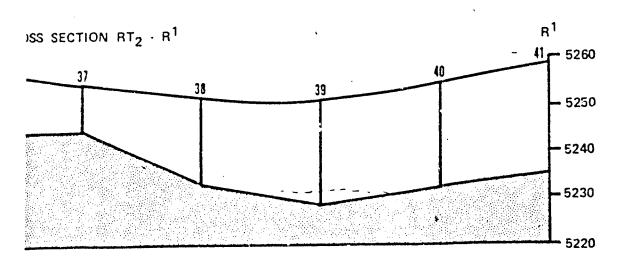


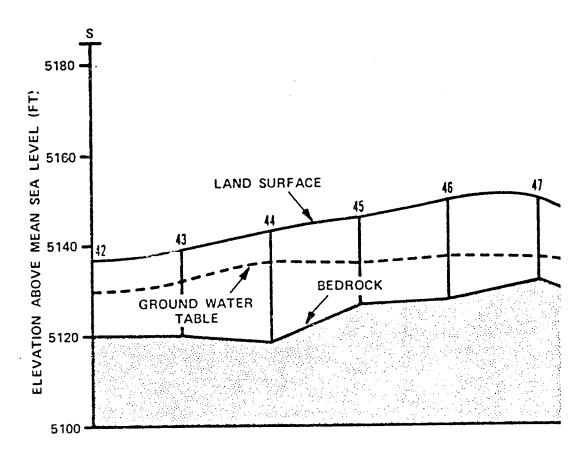


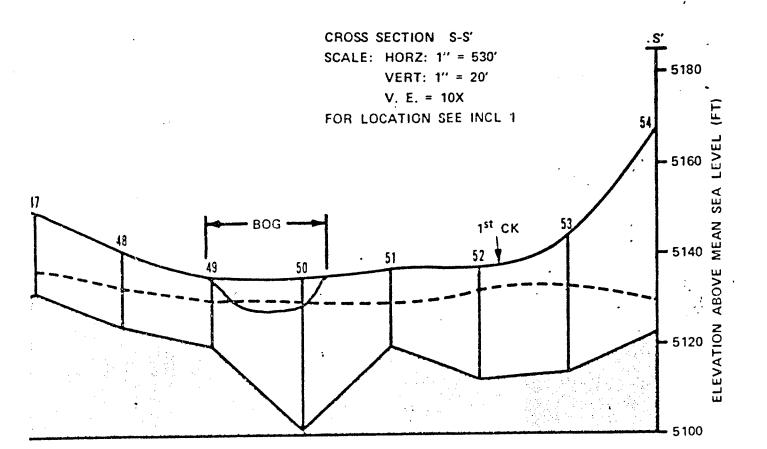
**SCALE:** HORZ: 1" = 300'

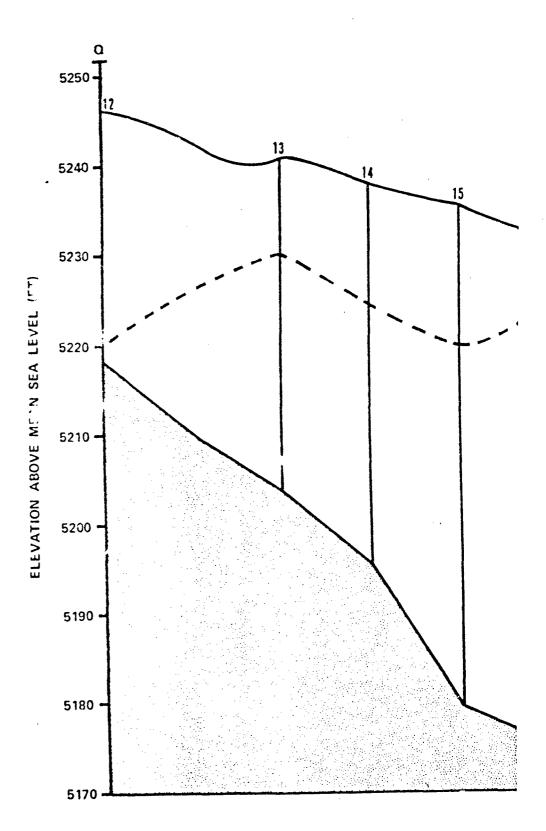
**VERT: 1" = 20'** 

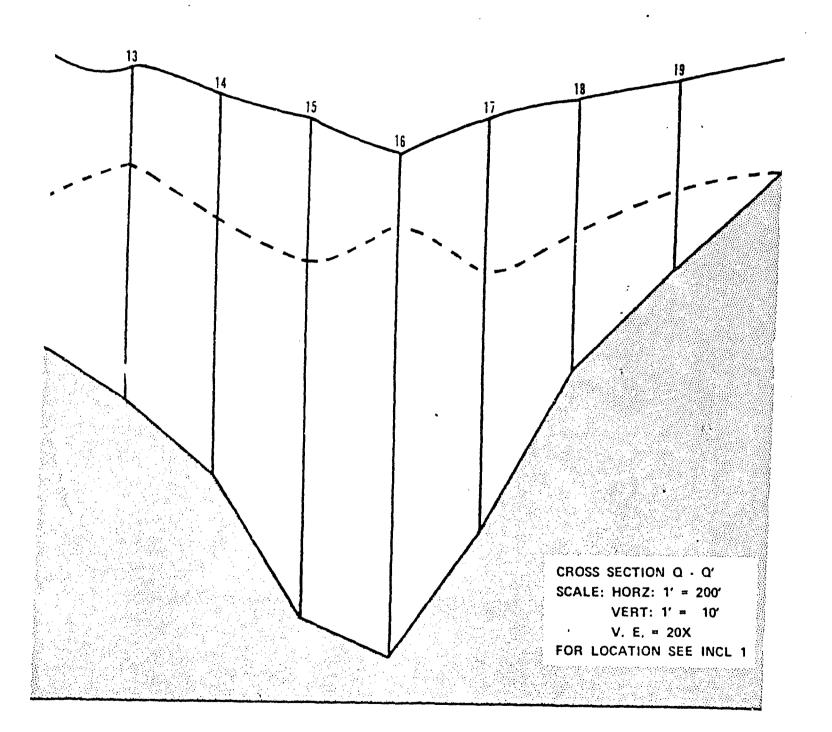


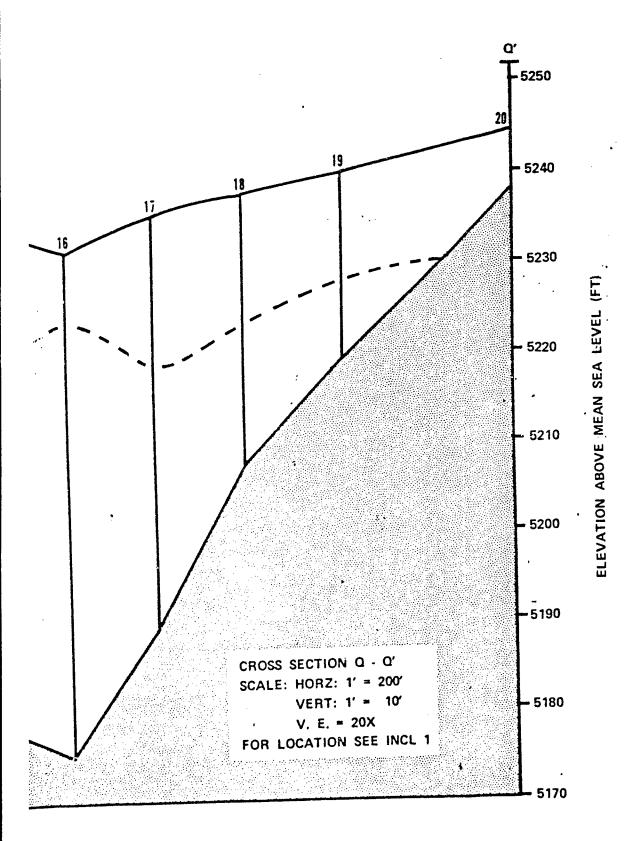


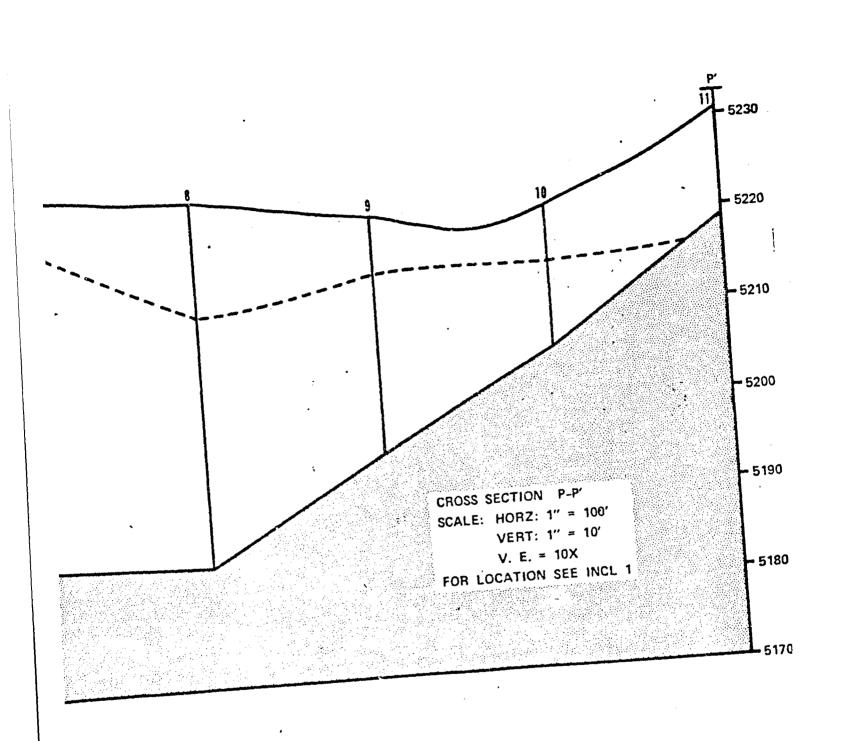


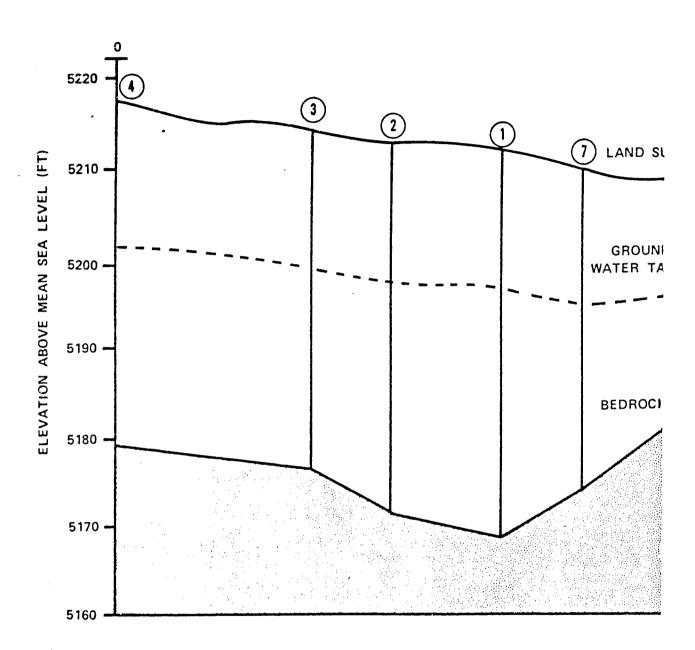




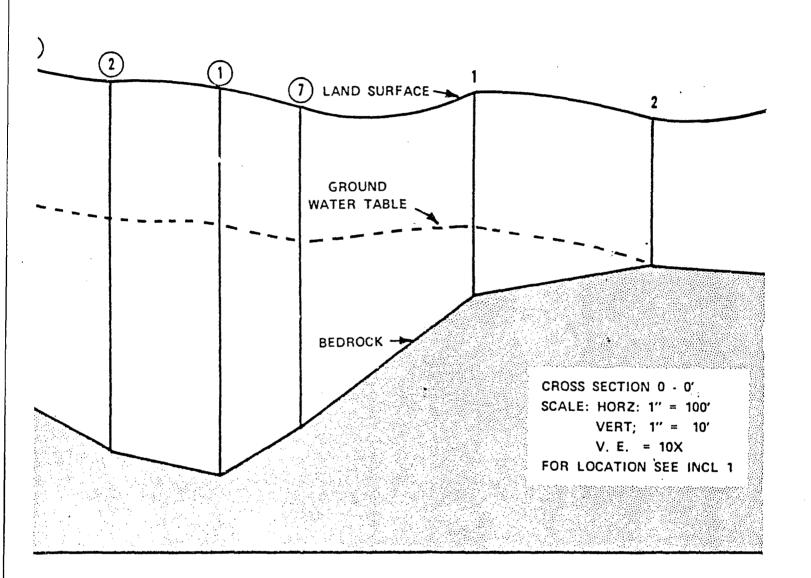




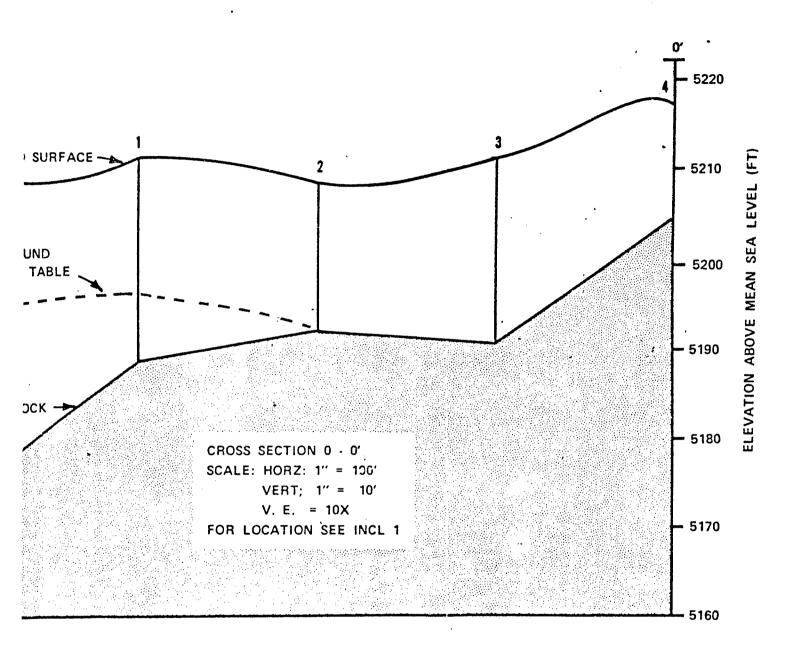




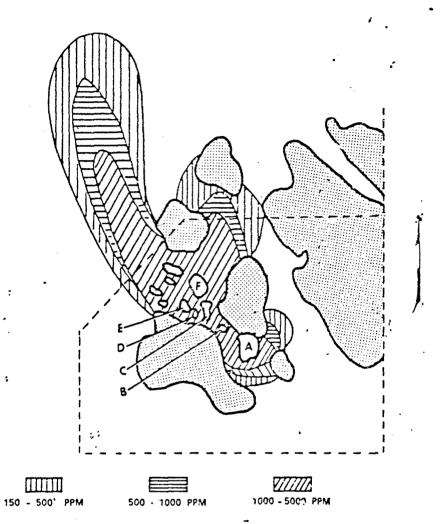
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1 MILE

OBSERVED AREA OF CHLORIDE CONTAMINATION IN 1956 (AFTER KONIKOW, 1975)